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Introduction

1.1 The Imbalanced Status of Bamboo Development in the World

Bamboo is widely distributed in the developing countries of Africa, Asia and Latin America, while many developed countries in Europe and North America, including Japan and Australia, are key consumer countries of bamboo products. Among these developed countries, Japan is an exception, because it has a natural distribution of bamboos. The country used to have a very developed bamboo sector, but because of labour shortage and costs, there is no longer any large-scale bamboo production in Japan, and it has now become an important bamboo consumer country, especially of bamboo food products.

Although the global distribution of bamboos is quite wide, people's awareness of the roles of bamboo is quite different. Before the 1980s, in most bamboo-producing countries, bamboos were still growing in natural stands, with little or no management. Bamboo products were made in a traditional, handmade way, using traditional technologies, and they were also traditional products for local markets; there was little or no industrial processing.

However, earlier, before the 1950s, some bamboo-producing countries, influenced by their long history of civilization and traditions with bamboo, had started research on bamboo biodiversity, its ecological and biological characteristics, its timber properties and processing technologies.

For example, India, China, Brazil and Vietnam developed bamboo pulp processing industries. Equally, Colombia and some other Latin American countries established bamboo construction industries. In China and other South-east Asian countries, a small-scale bamboo shoot processing industry already had a comparatively long history. In some Latin American countries, such as Colombia, Ecuador and Peru, and in some Asian countries, such as the Philippines and China, the bamboo furniture industry was also well developed before the 1980s. Between the 1950s and 1960s, China and India started to research and develop ply bamboo and boards. At the same time, Japan and Taiwan, China (henceforward 'Taiwan') had started the mechanical processing of bamboo mats, curtains, sticks and laminated boards. From 1986, Mainland China began to introduce bamboo-processing machinery from Taiwan and thus a larger scale and industrialized bamboo sector came into being. Not long after this, it was possible to produce all types of bamboo-processing equipment in Mainland China.

Until recently, there were still development gaps and an imbalanced development situation among bamboo-producing countries. However, in the 1980s, under the influence of a number of early bamboo-developing countries, the first worldwide non-governmental organization (NGO) concerning bamboo – the World Bamboo Organization (WBO) – was established (in 1984), and organized the First World Bamboo Congress



Fig. 1.1. Bamboo fossil from the 2014 Beijing Garden Expo (Zhu Zhaohua).

(WBC). In 1997, the first intergovernmental bamboo and rattan network – the International Network for Bamboo and Rattan (INBAR; since May 2017 the International Bamboo and Rattan Organization) was launched. As a result of the efforts of the above organizations, global awareness of bamboos and bamboo development, and their roles, were greatly raised.

1.2 The Co-efforts of the IDRC, IFAD and a Number of Countries in Promoting Bamboo Sectors in the World, and the Establishment of INBAR

The first to introduce bamboo to international society, the IDRC has made crucial contributions.

The International Development Research Centre (IDRC) of Canada was the first organization that introduced bamboo into global view, and raised

attention of it in the international sphere. IDRC sponsored an international workshop on bamboo and rattan in Singapore in 1980, and this initiated international exchange and communication about these two valuable non-timber forest resources that used to be neglected. From then on, IDRC started to sponsor major producing countries of these two resources in conducting research. This research has led to a wide interest, with the number of participating countries and organizations increasing rapidly. In 1993, IDRC organized an international conference in India, where INBAR was formed as an international cooperation and development programme. In 1994, INBAR succeeded in obtaining funding from the International Fund for Agricultural Development (IFAD). The early projects of INBAR successfully raised people's awareness of the significance of protecting and developing the two important plants and their related industries. However, people soon realized that a single international cooperative programme may not be able to continuously support the promotion of global bamboo and rattan sectors in the long run.

In order to promote the protection of biodiversity and the sustainable development of bamboo and rattan globally, and improve their services in the construction of ecological systems and contributions to livelihood improvement in poor regions and countries – as well as their benefits to consumers and producers – IDRC, IFAD, and a number of major countries participating in the INBAR programme (including China, India, Malaysia, Thailand, etc.), started discussions about establishing an independent and permanent international organization based on the original INBAR programme. In March 1995, consultants of the INBAR programme and the main project experts from IDRC, IFAD, India, China, Malaysia and Thailand held a meeting in Malaysia, after which a Special Taskforce Group for the Preparation of INBAR Internationalization was established, and it was decided that INBAR's headquarters would be located in China. Soon after this, China established the 'China Leading Group of INBAR Launching', which was composed of the representatives from the Chinese Ministry of Foreign Affairs, Ministry of Science and Technology, Ministry of Forestry, Ministry of Finance and the Municipal Government of Beijing. Over more

than 3 years of cooperation, INBAR was established as an independent, intergovernmental and non-profit international organization on 7 November 1997 in Beijing. This INBAR is different from the INBAR mentioned earlier (which is an international programme initiated in 1993), although it shares the same name, and it works as the first international organization dealing with bamboo and rattan. At its launch, INBAR had nine founding member countries; by 2017, the number of member countries had increased to 43; except for Canada, all of the member countries are bamboo and rattan-producing countries located in Asia, Africa, Latin America, the Caribbean and Oceania.

According to its establishment Treaty, the Mission of INBAR is 'to improve the well-being of producers and users of bamboo and rattan within the context of a sustainable bamboo and rattan resource base by consolidating, coordinating and supporting strategic and adaptive research and development'. Since its establishment, INBAR has carried out a series of global and regional activities, and fostered cooperation with and among member countries; it has also played the role of an exchange network and platform for bamboo and rattan development strategies, policies, scientific research, technology transfer and international training (see INBAR, 2007). Professor Zhu was honoured to have been involved in the whole processes of preparation and launch of INBAR.

1.3 The WBO and WBC as Important International Cooperation and Exchange Platforms

1.3.1 Mission and goals of the World Bamboo Organization (WBO)

The WBO is a diverse group consisting of individual people, commercial businesses, non-profit associations, institutions and allied trade corporations that all share a common interest in bamboo. Its purpose is to improve and promote bamboo, as well as the conditions affecting it and the industry surrounding it. The Organization is dedicated to promoting the use of bamboo and bamboo products for the sake of the environment and economy.

The WBO is a US tax-exempt trade association that was formed to facilitate the exchange of information from around the world on the

environmental, socio-economic, biological and cultural aspects of bamboo. By bringing together people concerned with bamboo and creating mechanisms for global communication, the WBO's goal is to facilitate the development of partnerships and alliances to advance the cause of bamboo worldwide.

1.3.2 The World Bamboo Congress (WBC)

The WBC is a unique event that encourages global interaction by providing a platform for direct networking and the sharing of ideas and information. Up to 2015, ten WBCs were held: in Puerto Rico (1984), France (1988), Thailand (1991), Indonesia (1995), Costa Rica (1998), India (2004), Thailand (2009), Belgium (2012) and South Korea (2015).

The Congress has become an important international exchange platform on bamboo issues. Each Congress has attracted large numbers of bamboo experts, who gathered to exchange information on the latest research results and new products. The theme of each Congress varies according to the status of bamboo development in the world, and the 'hot' topics have been ever-changing. The main issues that have been the concern of the Congress have been guiding the world bamboo sector by providing new fields and directions of development.

Below is a simple introduction to the Tenth WBC held in Damyang, (South) Korea, in 2015 (WBC, 2015), which describes the activities that were involved.

The World Bamboo Fair

The Fair was divided into two parts, the Korea Pavilion and the International Pavilion. Rich information and many fine products were found in the Korea Pavilion. The exhibition gave a systematic introduction to the development history, resources, management and culture of bamboo in the country. The bamboo industry of South Korea features fine and high value-added handicrafts, for example, bamboo musical instruments and fine crafts. Besides these products, South Korea has also developed innovative bamboo-processing techniques for cosmetics, health drinks, medicines, special bamboo salts, bamboo composite materials and bamboo coffee and wines, etc. The International Pavilion

gathered various bamboo products from all over the world, ranging from those most advanced in technology to the most special in cultural features.

The Bamboo Seminar

The Seminar was held on 18–22 September 2015, and was a very compact but ordered event. The contents were divided into topics on bamboo architecture, bamboo and climate change, bamboo and environment, large-scale bamboo silviculture, bamboo and community development, etc. In the Seminar, bamboo architecture and bamboo carbon trade seemed to be the main focus, and there were quite a number of articles and presentations on architecture. These presentations were of wide interest to the participants from Europe, North America, Asia, Latin America and Africa. More than 400 participants from around 30 countries attended the Seminar.

World Bamboo Day

At the Eighth WBC (2009) in Thailand, the Thai Royal Forestry Department proposed the designation of September 18 of each year as World Bamboo Day, and more than 350 participants of the Congress from 41 countries agreed to this initiative. Representatives from each country planted a bamboo plantlet at the Garden of the Thai Royal Research and Development Center as a token of their respective countries. Since then, 18 September each year has become an opportunity to speak out loudly about bamboos, plant bamboos and carry out other bamboo-related activities. The initiative has successfully promoted the protection of bamboo resources, as well as their sustainable management and utilization worldwide.

The World Bamboo Design Competition

In 2014, the Organizing Committee of the WBC decided to hold a 'World Bamboo Design Competition' during the 2015 Congress. This event was supported by the Korea Institute of Design Promotion, the Forest Service and the Ministry of Agriculture, Food and Rural Affairs. Winners included designers from India, Portugal and the Netherlands for the Household Goods Category, from South Korea, China, Ghana, the Netherlands and Vietnam for the Transportation Category and from South Korea, Indonesia and the

Philippines for the Architecture Category. The prizes ranged from US\$1000 to 10,000.

The World Bamboo Congress Bamboo Pioneer Award

The WBC Bamboo Pioneer Award was first initiated in the Eighth WBC in Bangkok, Thailand. Why this award? Its introduction as stated by the WBO was:

From its reputation as a 'poor man's timber' to its current potential as a high-end product that provides better structural, architectural and visual qualities over traditional alternatives, bamboo's use globally has progressed at an unprecedented rate. Additionally, bamboo has been rediscovered as an alternative fibre, an alternative to fossil fuels, a substitute for plastic, a nutritional food supplement, and a green resource to mitigate climate change, as well as a viable tool for rural economic development. Dedication, determination and collaboration are required to advance any scientific endeavour, and those individuals whose lifelong commitment to bamboo science deserve our attention and honoured recognition.

At the WBC in Thailand, nine people won the awards; they were from Japan, Thailand, the USA, Germany, Canada, Taiwan, Colombia, the Netherlands and Mainland China. At the Damyang WBC, four people won the awards. They were Professor Jorge Morán from Ecuador, who has been researching on bamboo architecture; Dr Dina Nath Tewari from India, who has been working on rural development and relative policy studies; Mr Choi Hyungsik from South Korea, Governor of Damyang County, who has been promoting the development of effective use of bamboo in the county, and was also a great contributor to the Damyang WBC. Professor Zhu was honoured when awarded the title of Bamboo Pioneer at the Damyang WBC.

Launch of the World Bamboo Ambassadors platform

In order to facilitate international cooperation on bamboo development, and to raise people's awareness of the status of bamboo development in different countries and regions, the WBC launched a new platform in 2015 called the 'World Bamboo Ambassadors'. The Ambassadors



Fig. 1.2. The World Bamboo Pioneer Award at the 2015 World Bamboo Congress (from left to right: Michel Abadie, President of the WBO; Jorge Moran; Choi Hyungsi; Susanne Lucas; D.N. Tewari; and Zhu Zhaohua).

comprised a number of enthusiastic, progressive and dedicated persons from important bamboo-producing countries who wanted to push forward the global potential of bamboo.

1.4 The Impacts of International Training Activities in China on World Awareness of Bamboo and its Roles

The special roles of China in raising the world's awareness on bamboo

With the support of China's Ministry of Science and Technology (MOST) and its Ministry of Commerce (MOFCOM), INBAR has cooperated with the International Farm Forestry Training Center (INFOTRACE) of the Chinese Academy of Forestry (CAF), the Lin'an Modern Forestry Technology Service Center (LMFTSC) in Zhejiang Province, the China National Bamboo Research Center (CBRC) of the State Forestry Administration (SFA) and the China International Center for Bamboo and Rattan (ICBR) in organizing a series of international training activities on bamboo and rattan. Now, let me take the earliest international bamboo training courses

as an example – the MOST/INBAR annual training programme. From 1998 to 2015, more than 1100 people were trained in the programme, of which a major part of the participants came from developing countries in Asia, Africa, Latin America and the Caribbean and Oceania, with a lesser part coming from Europe, North America, Japan and related international organizations. In addition, at the request of member countries and related international organizations, the training programme has also organized in total 25 special study tours and training courses. Zhu Zhaohua and Jin Wei played major roles in organizing the above training courses and study tours.

The above capacity-building activities have significantly raised world awareness of the impact of the roles of bamboo and rattan in ecological construction and poverty alleviation, and international society has accepted the concept that bamboo and rattan products are environmentally friendly. At the same time, a very important role of these training activities was to provide a platform for the exchange of experiences and technology transfer among countries. The above achievements have resulted in a great increase of interest among bamboo-producing countries. A number of countries have started to study China's industrial bamboo-processing

technologies, introduce machinery from China's mainland and Taiwan area, and initiate the industrialization of their own bamboo sectors.

1.5 The Development of Bamboo Industries in Bamboo-producing Regions

Through two decades years of practice, we can see a number of successful cases in the industrialization of the bamboo sector. In Asia, bamboo development is faster and has great advantages in many aspects compared with other parts of the world. India's bamboo industrialization is now on full course, and there have been successful cases in the development of bamboo panels, the use of bamboo in construction and bamboo energy forests. In the Philippines, many government officials, entrepreneurs and researchers have attached great importance to the development of bamboo; they have been working actively in the preparation of large-area plantations, and have been quite innovative in bamboo construction, furniture and engineered board production. Vietnam has introduced more than 100 bamboo primary-processing production lines and equipment from China, and has been very successful in making bamboo chopsticks, bamboo sticks and laminated boards, and in engineered board production. Vietnam has also introduced equipment for the production of Pressed bamboo materials (other names describing the same material include: bamboo-based fiber composite, bamboo scrimber, strand woven bamboo material, reconstituted bamboo material, etc., herein after all called pressed bamboo) and is now able to produce pressed bamboo on a large scale, and to further process these materials into flooring, decorative boards and furniture. Although there are still some problems, such as low utilization rate and low product quality, Vietnam has basically been successful in the industrial development of its bamboo sector. The country has been especially successful in the industrial planting and processing of sympodial bamboos.

In Africa, countries such as Ghana and Ethiopia have already started the industrial processing of bamboo curtains and charcoal, while Rwanda, Ethiopia, Madagascar, Ghana and Kenya have started to develop bamboo plantations for culm and shoot production. In Latin America

and the Caribbean, Ecuador, Colombia, Peru, Bolivia, Brazil, Mexico and Costa Rica, there has been further development of their bamboo construction sectors, and positive results have been achieved in the production of bamboo laminated board and furniture. Chile and Ecuador, respectively, introduced fine sympodial and monopodial bamboo species from China in 2008 and 2003. Chile has made great breakthroughs in the processing of shoots of *Chusquea culeou*, and the canned shoots were welcomed in the market. Brazil, Ecuador, Colombia, Peru and Mexico have started to attach importance to the development of bamboo plantations. Brazil especially has established large-scale industrial plantations for pulp purposes, and has successfully managed the plantations for 40 years.

1.6 Problems in Bamboo Industry Development Still Exist in Some Countries and Regions

Through the efforts of the international organizations introduced above – such as WBO, INBAR, and a series of international training activities carried out in China, as well as the efforts of a number of bamboo-producing countries, the world's awareness of bamboo-based development has been greatly improved. However, it is worth particular notice that there are still quite a number of bamboo-producing countries in the world, including many countries in Africa, where bamboos are not getting wide attention, and are still left in the wild without management. In some countries, bamboos are even treated like weeds that need to be eliminated. Many countries still lack clear policies on bamboo resource management and utilization, and because there are no regulations on property ownership, the bamboos can be harvested at free will. Some other countries have ended up doing the opposite – they have banned natural bamboo forest harvesting, and thus, without reasonable management and utilization, natural bamboo forests are left to degrade over large areas. In other countries, it can be seen that after realization of the values of bamboo and bamboo development – especially by entrepreneurs and citizens of those countries, and inspired by their visits and studies in China – the purchase

of equipment and building of factories has been commenced hurriedly, without a careful feasibility study and strategic plan, and so the projects have finally failed. There have been quite a number of such cases.

Based on the (first) author's observations and studies on the cases of 23 bamboo-producing countries in Asia, Africa and Latin America, and on information gathered from participants in international training workshops and seminars, combined with his research on China's bamboo development history, he feels deeply that developing a bamboo sector is quite complex. It involves stakeholders from a wide range of working fields and different walks of life; at the same time, there are a number of key factors that affect the development course taken by the sector. The development of a bamboo sector is not simply related to technical and investment issues, and the industrial production of bamboo is more complicated and difficult than other 'normal' production processes. The basics of a bamboo production industry include large-scale, highly qualified bamboo resources and a favourable policy and investment environment; at the same time, the development of the industry needs a thorough strategic plan that has carefully considered the local conditions and the practical feasibility. Other must-have conditions for achieving sustainability and success include the multi-participation of the government, private sectors, bamboo producers and scientists, which is key for realizing a multiple win situation, and the continuous innovation of new products that meet market demands.

Although the development of a bamboo sector is very complicated, a successful and sustainable bamboo sector can be attained through an understanding of the development rules of the bamboo sector, by providing the necessary basic conditions that the development of the sector needs, and by multi-stakeholder participation. Most important is the development of a featured bamboo sector that will fit into the special conditions of the country or the region, while learning from the good practical experiences of the other countries and regions.

1.7 The Purposes of the Book

In order to achieve sustainability of the bamboo sector in various regions and countries, and

under varying conditions, there are two basic points that we want to note in the international training projects we are organizing in collaboration with INBAR and MOST. One is to introduce China's successful experiences and practices to other countries. The other is to increase awareness that holding training courses in China does not mean that the delegates have to duplicate China's development mode and products at home; on the contrary, it means exploring ways of development that meet the special conditions of different countries and regions by investigating valuable experiences from China that have universal significance, and combining these with the specific development orientations, strategic approaches and product strategies that are identified based on local bamboo resources, and social, economic and personnel conditions. Through analysing the successful and failed cases in China and a number of other bamboo-producing countries in the world, in combination with studies made in 23 countries, knowledge learned in bamboo-related international training workshops, and study tours to China organized for a number of countries and related international organizations, and participation in international seminars, the authors would like to share and discuss with the readers of the book our learning from experience, in the hope that this piece of work inspires more valuable and remarkable cogitation and initiatives on the sustainable and healthy development of the world's bamboo sector.

In this book, there are three primary questions the authors would like to answer and discuss with readers. First, compared with other plants, especially trees, what are the special features of bamboo and its outstanding contribution to human beings? Second, a question concerning most people and a motive that led me to write this book: how may the bamboo industry be developed in a sustainable way? We try to bring some successful practices and lessons learnt from failure cases around the world, especially practices and experiences from China's bamboo sector, to elaborate on eight factors that affect the sustainable development of the bamboo industry, factors that the authors believe should be valued during development of the bamboo industry. Third, what are my humble suggestions to countries and enterprises that have just started their

bamboo businesses. In addition to posing these questions, this book has been inspired and facilitated by many of the authors' peers working internationally who have participated in my training workshops or interviews, and want

Professor Zhu to officially publish a book to share his knowledge, experiences and understanding. Professor Zhu considers this book to be a modest inspiration for all friends who are interested in the sustainable development of bamboos.

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